PERIPHERAL SPECIES OF THE *OREOHELIX METCALFEI* COCKERELL COMPLEX (PULMONATA: OREOHELICIDAE)

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ABSTRACT

New data is presented concerning past and present distribution of land snails of the Oreohelix metcalfei *Cockerell complex, especially as regards species on the periphery of the range of the complex. Two new species are described:* Oreohelix caballoensis *and* O. confragosa. *Some trends concerning evolution of the shells are noted.*

INTRODUCTION

Treated herein are several taxa of the *Oreohelix metcalfei* Cockerell complex of land snails (Pulmonata: Stylommatophora: Oreohelicidae). These taxa occur, living and fossil, in several mountain ranges of south-central New Mexico and seem restricted to areas of limestone bedrock. *O. metcalfei* was described by Cockerell as a subspecies of *O. strigosa* (1905:113-114) from a specimen collected by O. B. Metcalfe from "Mountains near Kingston, New Mexico," in the east-central foothills of the Black Range in Sierra County (Fig. 1). O. B. Metcalfe (not to be confused with the present author) collected botanical and other specimens in south-central New Mexico in the early 1900's. Pilsbry (1939:509-514) recognized several subspecies of *O. metcalfei* and one related species as appertaining to the complex.

Major aims here are to present additional data regarding the distribution of the complex and to point out the existence of fossil localities, of small extent areally and easily overlooked. Hopefully this may contribute to an eventual thorough analysis of the entire *O. metcalfei* complex. Such an undertaking would require much additional field work in the fastnesses of the Black Range (Fig. 1) where access is largely by hiking and horseback. This Range comprises the Black Range Primitive Area of approximately 300 square miles plus an area of approximately equal extent outside the Primitive Area. Until such time as a definitive analysis is undertaken it remains highly problematic as to which taxa in the complex more properly deserve specific recognition and which should only be considered subspecies of *O. metcalfei.* This is, of course, a common problem in the systematics of montane snails, which in their evolutionary zeal have taken little heed of the strictures of binomial or trinomial nomenclature. Herein two new names are provided chiefly as a utilitarian measure to facilitate future revisions. As a practical expedient, I refer to species rank several kinds from mountains or mountain groups peripheral to the Black Range (Fig. 1) and separated from it by extensive intermontane basins. Variants from the Black Range itself are considered as comprising a number of subspecies of *O. metcalfei* as treated by Pilsbry (1939) for all taxa of the complex except *O. pilsbryi* Ferriss, which he relegated to species rank.

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Abbreviations used for museums in which materials have been deposited are: ANSP = Academy of Natural Sciences of Philadelphia; DMNH = The Delaware Museum of Natural History; MALB = Museum of Arid Land Biology, The University of Texas at El Paso.

DESCRIPTIONS OF NEW SPECIES

Oreohelix caballoensis *new species*

Figs. 2, 3

Description of Holotype: (Fossil shell, ANSP 332307) Shell heavy, moderately elevated, convex dorsally and ventrally, 19.4 mm in diameter and 12.0 mm in height; slightly angular peripherally; last whorl descending markedly to aperture; aperture 9.0 mm wide and 8.1 mm high; umbilicus relatively narrow, 6.0 mm wide, contained 3.2 times in diameter; relatively tightly whorled, with 5.15 whorls; embryonic whorl with low, regular wrinkles, grading to low, regularly-spaced riblets on second whorl, remainder of dorsal surface with low, irregular growth striae, becoming coarser towards aperture; ventral surface relatively smooth except for occasional growth striae (spiral striae not observed); shell generally white but light tan on first 2½ whorls dorsally and with two reddish brown bands, one immediately below peripheral angularity on body whorl, intersecting upper edge of lip and obscured from that point on, proximally; the other a lighter spiral band in center of dorsal whorls from beginning of whorl three, distally, fading near aperture on body whorl. Type locality, Locality 1 in "List of Localities," hereafter, and in Fig. 1.

Variation: (Paratypes: DMNH 70647 and MALB 3343, Loc. 1; ANSP 332308 and MALB 3631, Loc. 2). Only three entire mature shells and several broken shells were obtained at the type locality (Loc. 1). Paratypes (also fossil) from Locality 2, in the lower western foothills of the Caballo Mts., seem to have been slightly smaller at maturity with more tightly whorled shells. For ten specimens from this locality, diameter/number of whorls averaged 3.22, while three measurable specimens from the type locality averaged 3.46. Umbilicus is relatively larger for specimens from Locality 2, with diameter/width of umbilicus averaging 3.27 for ten specimens against 3.89 for the three specimens from Locality 1.

Comparisons: Compared to the subspecies of *O. metcalfei*, *O. caballoensis* most resembles *O. m. hermosensis* Pilsbry and Ferriss and *O. m. cuchillensis* Pilsbry and Ferriss. These kinds are from northeastern foothills of the Black Range and the nearby Cuchillo Mts. (Fig. 1), *ca.* 30 miles northwest and north-northwest, respectively, of the northern part of the Caballo

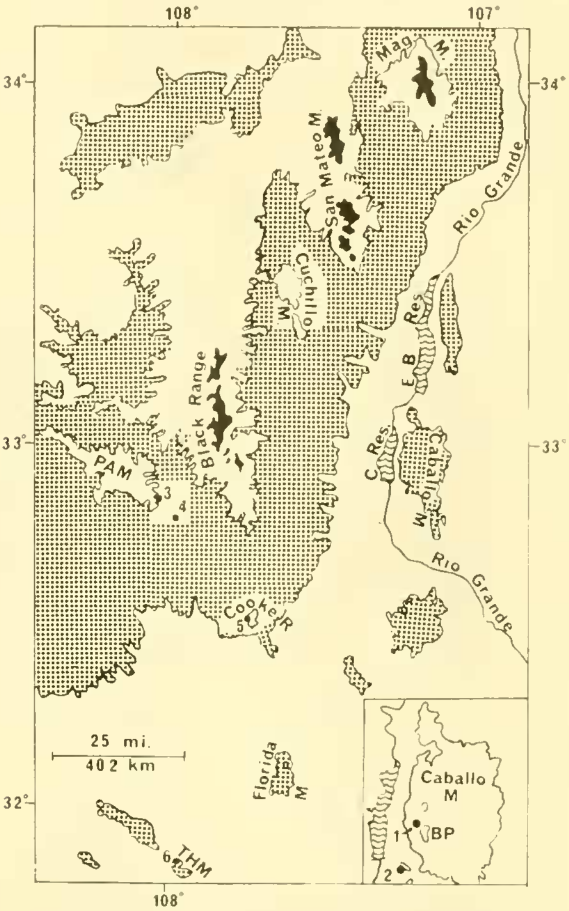


FIG. 1. Map of south-central New Mexico indicating features mentioned in text. Contours at 5000, 7000 and 9000 feet indicated by contour lines, with elevations between 5000 and 7000 feet dotted and elevations above 9000 feet black. Reservoirs on Rio Grande indicated by wavy lines. Localities mentioned are indicated by number and black dot. Inset at lower right is of central and northern part of Caballo Mts. (5000 and 7000 feet contour lines indicated) and of Caballo Reservoir.

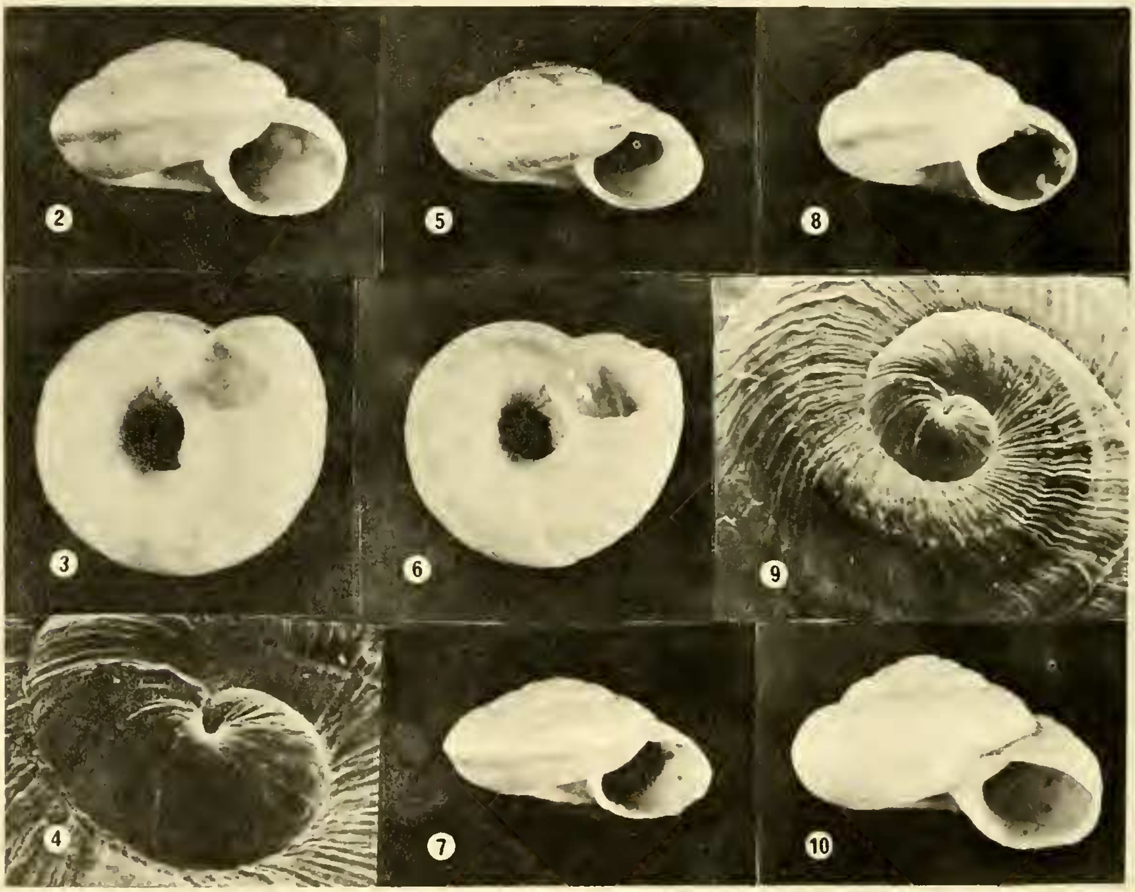
Abbreviations: BP = Brushy Peak of Caballo Mts.; C. Res. = Caballo Reservoir; E B Res. = Elephant Butte Reservoir; M = Mountains; Mag. M. = Magdalena Mts.; PAM = Pinos Altos Mts.; THM = Tres Hermanas Mts.

Range and seem a likely source for propagules reaching the Caballos. Shells of *O. m. hermosensis* and *O. m. cuchillensis* are, however, more depressed with a slightly larger umbilicus than in *O. caballoensis.*

Etymology: From *Caballo* (Sp., horse), in reference to the Caballo Mts., in which the species occurs.

Oreohelix confragosa *new species*
Figs. 4-7, 9

Description of Holotype: (Fresh shell with desiccated soft parts, ANSP 332309). Shell heavy, convex dorsally and ventrally, 17.7 mm in diameter and 10.3 mm in height, bearing rounded keel peripherally at *ca.* mid-height, keel reduced to an angularity on distal-most part of body whorl, keel bordered by spiral, occasionally coarsely punctate grooves above and below, these also fading out on last ¼ of body whorl; aperture round except for slight angularity in outer lip at position of keel, 8.2 mm wide and 8.3 mm high; umbilicus relatively narrow, 4.7 mm wide, contained 3.8 times in diameter; 5 whorls; embryonic whorl with regular, smoothly arcuate wrinkles, these



FIGS. 2, 3. Holotype of Oreohelix caballoensis *n. sp., (19.4 mm diameter). FIG. 4. Embryonic whorls of* Oreohelix confragosa *n. sp. (scanning electron micrograph, 100X). FIGS. 5, 6. Holotype of* Oreohelix confragosa *n. sp., (17.7 mm diameter). FIG. 7. Fossil specimen of* Oreohelix confragosa *n. sp. from Locality 4, (17.6 mm diameter). FIG. 8. Fossil specimen of* Oreohelix florida *Pilsbry from Tres Hermanas Mts., Locality 6, (16.6 mm diameter). FIG. 9. Apical whorls of* Oreohelix confragosa *n. sp. (scanning electron micrograph, 50X). FIG. 10. Fossil specimen of* Oreohelix florida *Pilsbry from Cooke Range, Locality 5, (21.1 mm diameter).*

wrinkles becoming higher and sinuous at 1 to 1¾ whorls (sinuosity in riblets caused by their intersection with two very low spiral ridges and with the spiral groove atop keel), wrinkles grading into sharp, well-defined riblets at 1¾ to 2½ whorls, these riblets fading out at 2½ to 2¾ whorls with irregular coarse growth wrinkles on remaining whorls dorsally; exceedingly fine, close-spaced spiral striae visible at many places on both dorsal and ventral surfaces of shell; irregularly round to elongate scattered pits on both surfaces; coarse growth wrinkles on ventral surface; shell generally whitish, with extremely faint, diffuse, grayish brown band immediately below keel on proximal half of body whorl, covered proximally by upper margin of lip; a few light gray spots on ventral surface with a faint, shadowy, gray spiral band (with interruptions) on proximal ⅓ of body whorl; dorsally, initial 2½ whorls light grayish brown, irregular gray to brownish gray splotches on whorls 2½ to 4 and a few gray spots on proximal part of body whorl. Type locality, Locality 3 in "List of Localities" and in Fig. 1.

Genitalia: (Data from paratypes from Locality 3; see Fig. 11). Penis swollen in middle part but narrowed distally, bearing a small lateral cornuted appendix distally; internally, wall of proximal 45% bears fleshy longitudinal folds, while that of the distal 55% bears "checkrows" of small quadrate papillae, except for one longitudinal groove that is free of papillae; area of tract joining penis to epiphallus slightly inverted back into penial cavity; retractor muscle strands attached to both penis and epiphallus at their area of juncture; epiphallus short and stout and vas deferens relatively short as in *O. metcalfei radiata* and *O. pilsbryi* (Pilsbry, 1939; Fig. 331); free oviduct short, talon darkly pigmented. Lengths for some organs for three specimens with shell diameters of 14.0, 14.5 and 17.3 were, respectively: penis: 6.4, 7.5, 8.2; epiphallus: 2.2, 2.6, 2.5; vas deferens: 4.7, 6.5, 5.9; vagina: 2.4, 2.7, 3.3; free oviduct: 1.7, 1.5, 2.1; spermathecal duct and sac: 7.8, 8.4, 11.5.

Variation: (Paratypes: ANSP 332310, DMNH 70649, Dallas Museum of Natural History 3867, MALB 3495, Locality 3; ANSP 332311 and MALB 3494, Locality 4). For 30 paratypes from the type locality (Loc. 3) the following proportions were obtained (mean outside parenthesis; range inside parenthesis): Diameter/number of whorls: 3.54(3.16-4.02); Diameter/width of aperture: 2.34(2.12-2.50); Diameter/height of aperture: 2.33(2.14-2.63); Diameter/height of shell: 1.76(1.53-1.97); Diameter/width of umbilicus: 3.67(3.32-4.19). Proportions of fossil shells from Locality 4 are similar to the above but shells are slightly less tightly coiled, more depressed and with relatively larger apertures but smaller umbilici. For 20 specimens from Locality 4 proportions were: Diameter/number of whorls: 3.42(3.01-4.01); Diameter/width of aperture:

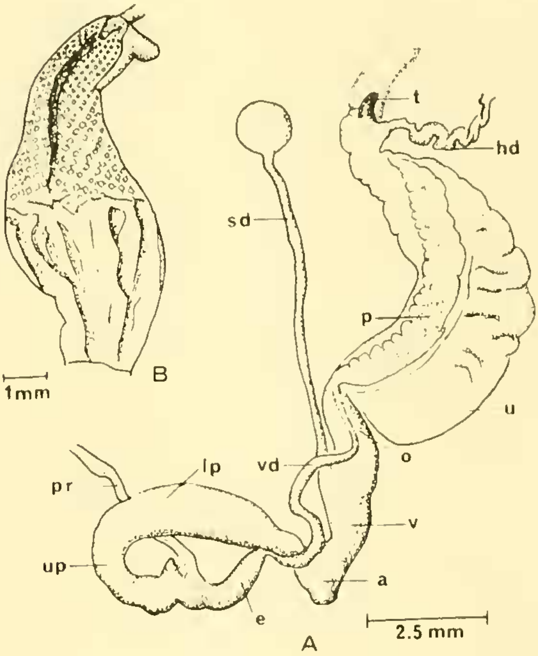


FIG. 11. A. Genitalia of Oreohelix confragosa *new species (paratype and topotype). Abbreviations:* a =*atrium;* e =*epiphallus;* hd =*hermaphroditic duct;* lp =*lower part of penis;* o =*free oviduct;* p =*prostate;* pr =*penial retractor;* sd =*spermathecal duct;* t =*talon;* u =*uterus;* up =*upper part of penis;* v =*vagina;* vd =*vas deferens.*

B. Longitudinal section of penis of O. confragosa *showing lower, costulate and upper papillose areas, inverted distal end and small lateral appendix.*

2.12(1.98-2.39); Diameter/height of aperture: 2.17(2.01-2.39); Diameter/height of shell: 1.81(1.62-2.01); Diameter/width of umbilicus: 3.83(3.40-4.50).

Fossil shells from Locality 4 retain, even in their fossil condition (Fig. 7), a well-defined reddish brown band below the keel. An equally well-defined brownish band is located centrally on the dorsal surface of all whorls succeeding the first two. A brown band is also found below the keel on younger (up to *ca.* 4) whorls on living (topotypic) specimens. In larger living specimens the ultimate (usually fifth) whorl covers much or all of this band. On younger shells, also, a dim brown band is observable on the upper surface of whorls as in fossils from Locality 4. This band fades with age, however, and is usually indiscernible on older shells. In regard to banding, then, living specimens seem ontogenetically to pass through a stage when they resemble the fossil specimens from Locality 4 as well as the more heavily banded "peripheral" species mentioned hereafter. Pilsbry (1939:413) discussed loss of the supposedly primitive bands in some kinds of *Oreohelix.*

Embryos closely resemble those figured by Pilsbry (1939: Fig. 333) for *O. m. radiata* and *O. m. hermosensis.* Young shells up to *ca.* two whorls bear several spiral rows of hairlike cuticular processes ventrally and on the keel and on each of two or three low spiral ridges dorsally (ridges observable in left part of Fig. 9). Short cuticular hairs are also produced on the keel of the third whorl and these persist in the shelter of the sutural depression on specimens up to 15 mm in diameter. Fig. 4 indicates presence of minute pustules on dorsal surface of the embryonic whorl at its origin.

Shells commonly exhibit rough radial corrugations and areas in which the outermost shell layers are broken or missing. Pits, scars and other irregularities also are common, these accumulating and becoming especially noticeable in older shells. The common occurrence of such areas suggested the name *confragosa,* L., broken, rough, uneven.

Comparisons: O. confragosa seems closer to the nominal subspecies of *O. metcalfei* than to any of the other named taxa of the complex. However, it is not as sharply keeled as is *O. m. metcalfei* and it is more convex (less pyramidal) dorsally. The surface of *confragosa* is more roughly sculptured radially. The distinct subcarinal brown spiral band of *O. m. metcalfei* is similar to that of fossil specimens of *O. confragosa* from Locality 4 but is lacking on adults from the type locality.

DISCUSSIONS

The *O. metcalfei* complex seems to include the following components (locality numbers and geographic features mentioned are indicated in Fig. 1).

(1) In the Black Range and nearby Cuchillo Mts. occur six subspecies of *O. metcalfei* Cockerell. These are, in addition to the nominal subspecies, *acutidiscus, concentrica, cuchillensis, hermosensis* and *radiata,* all described by Pilsbry and Ferriss. One species, *O. pilsbryi* Ferriss, was also ascribed to the complex by Pilsbry (1939:514).

(2) In several isolated mountains to the south of the Black Range occur fossil or dead, bleached shells here assigned to *Oreohelix florida* Pilsbry. *O. florida* is a relatively distinctive member of the *O. metcalfei* complex, being robust, having the highest spire of any member of the complex, lacking spiral striae and possessing coarse, radial growth lines. As such, it seems deserving of specific status. Pilsbry (1939:513) described *O. metcalfei florida* from the Florida Mts., Luna County, from old, bleached shells (ANSP 103243). He also assigned two fossil shells from the Tres Hermanas Mts. *ca.* 25 miles southwest of the Florida Mts. to this taxon. I have taken one additional fossil specimen at Locality 6 in the Tres Hermanas Mts. (MALB 2642). I have also taken fossil specimens (DMNH 70648; MALB 3634) at Locality 5 in the Cooke Range, located between the Florida Mts. and the Black Range. Thus, *O. florida* seems formerly to have penetrated southward at least some 70 miles along these isolated montane "islands." It is doubtful whether it is still living in any of them, however, as the Tres Hermanas Mts. are a low and arid range and the Cooke Range lacks limestone in its higher, more mesic parts. Baldy Peak in the Florida Mts., a high, isolated,

massive limestone outcrop, may have been the last refuge of the species but collections made in this century suggest that *O. florida* is no longer living there. In 1970 I found only a few weathered fragments on the north side of Baldy Peak (MALB 1201). Pilsbry (1939) did not illustrate *O. metcalfei florida.* Figs. 8 and 10, herein, show shells from the Tres Hermanas Mts. and Cooke Range, respectively.

(3) The localities cited herein for *O. caballoensis* extend the range of the *O. metcalfei* complex to the east. This is the only member known to occur east of the Rio Grande Valley. It is doubtful that the complex ever extended any farther east as the next mountain range eastward, the San Andres Mts., seems, on the basis of fossils recovered, to have been inhabited only by *O. socorroensis*, discussed below.

(4) Localities of occurrence indicated for *O. confragosa* extend the range of the *O. metcalfei* complex to the west into the Pinos Altos Mountains.

(5) In the Magdalena Mts., some 50-60 miles north-northeast from the indistinct northern end of the Black Range, occurs *Oreohelix magdalenae* Pilsbry, shells of which, although slightly smaller, are close to those of *O. m. cuchillensis* and *O. caballoensis.* Pilsbry (1939:515) considered *O. magdalenae* to be a subspecies of *O. socorroensis* Pilsbry. This seems improbable, however, as (a) shells of the two differ morphologically, with *O. socorroensis* being more depressed, strongly carinate, with well developed spiral striae and lacking the brown banding of *O. magdalenae* and (b) *O. socorroensis* seems to occur only east of the Rio Grande Valley, chiefly as a fossil in mountains surrounding the Tularosa-Hueco Basin (Metcalf and Johnson, 1971:102-103), whereas *O. magdalenae* seems to occur only in the Magdalena Mts., west of the Rio Grande Valley. Probably *O. socorroensis* dispersed southward from a northern source in the *O. yavapai neomexicana* Pilsbry complex, whereas *O. magdalenae* seems more likely a northeastern derivative of the *O. metcalfei* complex.

The *O. metcalfei* complex probably has had its center of dispersal in the relatively large, high and complex massif of the Black Range from which it seems to have radiated propagules in all directions (Fig. 1). Most of the peripheral kinds (*O. magdalenae, O. caballoensis* and *O. florida* along with *O. m. hermosensis* and *O. m. cuchillensis* of the eastern foothills and adjacent ranges of the Black Range) show considerable similarity in having elevated, biconvex shells, in lacking a keel, in possessing relatively smooth shells lacking spiral striations and in possession of prominent brown spiral bands. Kinds of the central Black Range, on the other hand, exhibit to various degrees depression and carination of the shell, development of elaborate spiral and/or radial striae, ridges and grooves and the loss of brown banding. *O. confragosa* seems closer to the first (peripheral) group discussed but does possess fine spiral striae. Brown banding is extremely weak in living specimens of *O. confragosa* but fossils have better developed bands, suggesting that evolution towards loss of banding has taken place.

It seems probable that in the *O. metcalfei* complex shells of the "peripheral group," many of which are known only as fossils, are more conservative. Conversely, members of the complex inhabiting the Black Range in the highest, best watered part of the distributional range of the complex seem to show evidence of a greater degree of speciation than their more conservative, peripheral relatives.

Probably ancestors of the *O. metcalfei* complex managed to occupy in one or more Pleistocene pluvial episodes a number of mountain ranges in the region, possessing at that time the shell characters suggested above as being "conservative." Subsequent desiccation in one or more interpluvial episodes has resulted in extinction in some and restriction of range for other members of the complex. Peripheral representatives in smaller, lower mountains have been especially adversely affected. In the Black Range "heartland" of the complex, however, survival has been more successful and speciation has been relatively accelerated.

LIST OF LOCALITIES

1. Sierra Co.; 107° 14' W Long, 32° 56' 13" N Lat; 6200' elev.; Caballo Mts., from hillslope

colluvium of Pleistocene age at mouth of canyon on northwest side of Brushy Mt. This is a straight box canyon, the first canyon N of prominent mine on W face of Brushy Mt., and debouches near last "0" in "6000" elevation designation on Upham 15' Topo. Quad. A few specimens were also taken at mouth of a more tortuously branched canyon, located .65 mi. S, in colluvium.

2. Sierra Co.; SW¼,NE¼,SW¼, Sec. 28, T. 16 S. R. 4 W; 5000' elev.; western foothills of Caballo Mts., 2 mi. SSE of E end of Caballo Reservoir Dam, from Pleistocene hillslope colluvium on steep hillside *ca.* 100 ft. below massive limestone rimrock at top of prominent cuesta east of extensive mining area.

3. Grant Co.; near center of NE¼, Sec. 12, T. 17 S, R. 12 W; 6700' elev.; Pinos Altos Mts., .3 mi. WSW of west side of ruins of Georgetown (abandoned mining village) on S (N-facing) wall of Willow Springs Canyon, below massive limestone outcrop; snails living under flat limestone rocks derived from the cliffs above and strewing the slope; dominant plants on slope were *Juniperus monosperma, Pinus edulis, Quercus gambelii, Yucca baccata, Garrya wrightii* and *Symphoricarpos* sp.; collected Sept. 15, 1973.

4. Grant Co.; .45 mi. S of NE corner of Sec. 26, T. 17 S, R. 11 W; 6000' elev.; from whitish hillslope colluvium of Pleistocene age immediately NW of intersection of N.M. Hwy. 90 with paved road leading to San Lorenzo and Mimbres, at base of escarpment flanking Mimbres Valley on W side (E side of Pinos Altos Mts.).

5. Luna Co.; SE¼,SE¼,NW¼, Sec. 24, T. 20 S, R. 9 W; 6600' elev.; Cooke (or Cook) Range; cuts along road in steep hillside W of and above abandoned mining village of Cooke (Cook) at head of prominent NE-draining gulley (with trail shown on Lake Valley 15' Topo. Quad.) in central part of village; road cuts in Pleistocene hillslope colluvium of salient whitish color (visible several miles away) that contains fossils.

6. Luna Co.; center, N boundary of SE¼, Sec. 26, T. 27 S, R. 9 W; 4540' elev.; NE part of Tres Hermanas Mts., in alluvium exposed in arroyo bank immediately S of mine that is, in turn, WSW of Lindy Ann Mine (both shown on North Peak 7.5' Topo. Quad.).

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